DOCUMENT RESUME

ED 469 136   RC 023 704

AUTHOR   Roeder, Phillip W.
TITLE   School District Performance in Kentucky (1993-2001): Do
                Teaching and Financial Resources Moderate the Negative
                Effects of Poverty?
PUB DATE   2002-08-00
NOTE   36p.
AVAILABLE FROM For full text: http://www.uky.edu/~proeder/distperf02.pdf.
PUB TYPE   Numerical/Quantitative Data (110) -- Reports - Evaluative
                (142)
EDRS PRICE   EDRS Price MF01/PC02 Plus Postage.
DESCRIPTORS   *Academic Achievement; *Accountability; *Educational Change;
                *Educational Equity (Finance); Educational Finance;
                Educational Improvement; Elementary Secondary Education;
                Expenditure Per Student; Policy Analysis; *Poverty; Rural
                Urban Differences; *School Districts; School Effectiveness;
                Socioeconomic Influences; Standardized Tests; State Aid
IDENTIFIERS   *Kentucky; Kentucky Education Reform Act 1990; Policy
                Effectiveness

ABSTRACT
                An updated study of Kentucky school district performance
since the implementation of the Kentucky Education Reform Act of 1990 (KERA)
added 4 years of accountability data; compared the performance of various
districts; and explored district financial and teaching resources and their
impacts on performance. After the initial years of change implementation,
school districts became relatively stable in financing, teaching resources,
and performance. The average yearly gain of 11 percent in accountability
scores included a substantial 35 percent increase in 1999 when the
accountability system changed. Without this significant system change and
later adjustments to scores in 2001, the overall improvement in district
performance was much more uneven and less substantial than the 11 percent
average annual increase implies. The weakest-performing districts were slowly
closing the performance gap with the strongest-performing districts. Since
implementation of KERA, local education revenue as a proportion of total
education revenue slowly increased, while state education revenue as a
proportion of total education revenue decreased. The distribution of local
revenue per pupil, although improved, remained inequitable, while total
revenue per pupil was reasonably equitably distributed. Multivariate models
show that poverty and disadvantage were strong predictors of performance,
while measures of resources were not. Resource equity and adequacy did not
appear to reduce the negative effects of poverty on performance. There were
several significant differences in rates of transition to college and
secondary school dropout rates between Appalachian and non-Appalachian
districts, but not between rural and urban districts. However, none of these
groupings impacted accountability scores in multivariate models from 1993
through 2001. Appendices present school district performance data. (TD)

SCHOOL DISTRICT PERFORMANCE IN KENTUCKY (1993-2001):
DO TEACHING AND FINANCIAL RESOURCES MODERATE THE NEGATIVE EFFECTS OF POVERTY?

AUGUST 2002

by

Phillip W. Roeder
Department of Political Science
University of Kentucky

e-mail: proeder@uky.edu
ph. no. 859.257.1118
KERA research website: http://www.uky.edu/~proeder/keraweb.htm

SUMMARY

This paper updates and expands previous research on Kentucky's school districts found in Chapter 3 of *Education Reform and Equitable Excellence: The Kentucky Experiment (1999)*. http://www.uky.edu/~proeder/keraweb.htm The study adds four additional years of accountability data to assess district performance from 1993 through 2001, compares the performance of various groupings of districts (Appalachian, Council for Better Education, Inc. (CBE), rural, and independent districts), explores the equity and adequacy of district financial and teaching resources and their impacts on performance, and uses several new explanatory variables with the potential to improve multivariate models of school district behavior. The updated study finds that:

Despite a major policy shock (KERA) to the pre-1990 system of public education in Kentucky, after comprehensive reform and substantial program changes in the initial years of implementation, school districts have become relatively stable in financing, teaching resources, and performance.

Districts demonstrate much improvement in CATS (KIRIS) accountability scores from 1993 to 2001 (almost doubling on average from 36.6 to 68.4 points), however the average yearly gain of 11 percent includes a substantial 35 percent increase in 1999 when the KIRIS accountability system became the CATS accountability system. Without this significant system change and later adjustments to scores in 2001, the overall improvement in district performance

from 1993 through 2001 is much more uneven and less substantial than the 11 percent average annual increases implies.

In 2001, the weakest performing districts (bottom tenth) from 1993 remain on an absolute basis further behind the strongest performers (top tenth) than in the first year of testing, however when the performance gap is compared to the overall gain in scores for all districts from 1993 to 2001, the gap has declined. The weakest performing districts in 1993 are slowly closing the gap with the strongest performing districts from that initial year of testing.

Since the implementation of KERA, local education revenue as a proportion of total education revenue per pupil has slowly, but steadily increased, while state education revenue as a proportion of total revenue has decreased. Districts at the bottom in local revenue per pupil in 1991 made much greater funding effort than the districts at the top in local revenue from 1991-1999 (225 vs. 84 percent increase). In contrast, the bottom districts in state revenue per pupil increased only 34 percent in this period compared to 47 percent for the top districts. Despite these shifts in funding priorities, the distribution of local revenue per pupil, although improved, remains inequitable, while total revenue per pupil is reasonably equitably distributed from 1991 through 1999.

As total education funding has become more equitable across districts, issues of funding adequacy have become more prominent. Methods for assessing funding adequacy depend on assumptions about the impact of resources on organization operations and performance. In this study, multivariate models show only modest and inconsistent impacts of financial resources on accountability scores and other performance measures. Total revenue per pupil is related positively to accountability scores only in the 1997 model, while percentage change in total revenue is significant but negative in several models indicating that greater proportional increases in total revenue predict to lower scores. The analysis of school district revenues indicates the need for caution about revenue-performance linkages and assertions of revenue inadequacy.

To summarize the multivariate models of district performance, smaller districts with less family poverty that had higher levels of academic achievement prior to KERA have significantly higher accountability scores, somewhat higher rates of transitions to college, lower dropout rates, and lower unsuccessful transition rates when controlling for other predictors of performance. Measures of financial and teaching resources have much less consistent and significant impacts on performance. Although the distribution of resources remains relatively equitable and total revenue has increased substantially since 1990, multivariate models show that poverty and disadvantage are strong predictors of performance, while measures of resources are not. Resource equity and adequacy appear not to reduce the negative effects of poverty on performance.

Controlling for a number of district characteristics, there are several significant differences in rates of transition to college and dropout rates (grades 7-12) between Appalachian and non-Appalachian districts and independent and county districts, but not for Council for Better Education (CBE) and non-CBE districts or rural and urban districts. However, none of these groupings has any significant impact on accountability scores in multivariate models from 1993 through 2001.

INTRODUCTION

Previous research published in a 1999 e-book titled Education Reform and Equitable Excellence: The Kentucky Experiment found that after five years of accountability and testing (1993-97) and eight years of implementation of KERA, Kentucky school districts performed at higher levels on the KIRIS accountability index if they were "advantaged;" that is, they had proportionately fewer students eligible for free or reduced meals, experienced higher levels of academic success prior to reform, and had higher levels of financial resources prior to the introduction of KERA reforms. http://www.uky.edu/~proeder/keraweb.htm In contrast to some previous research, district characteristics that potentially could be controlled or managed by policy makers such as teacher qualifications, competition from the private sector, and extent of bureaucracy contributed little or nothing to an explanation of district performance. Also, despite the focus of KERA on closing the huge gap in financial resources across districts, a measure of change in per pupil state/local revenues due to KERA's financial reforms did not have any independent impact on performance. In the initial years of KERA implementation, schools and districts that received greater proportional increases in state and local funding did not perform at higher levels than districts with proportionately lower increases in funding.

The moderately high coefficients of determination and significant regression coefficients in yearly cross-sectional models suggested that KERA's comprehensive and extensive reforms had not yet overcome previously existing disadvantages of community wealth and poverty and district academic climate. The most advantaged school districts continued to perform at substantially higher levels than the least advantaged districts, at least in the initial period of KERA implementation.

This study updates and expands that previous research by assessing district performance from 1993 through 2001 and by examining several additional explanatory variables with the potential to improve explanations or models of district behavior and the potential to be changed by policy makers to achieve higher levels of performance. These variables include data from district report cards (a program initiated in 2000) as well as other sources. Also, measures of district performance in addition to test scores (dropouts, transitions to college, and unsuccessful transitions) as well as more extensive data on district revenues and expenditures are described and assessed in this research project.

DISTRICT ACCOUNTABILITY

Table 1 shows the substantial improvement in district accountability scores since 1993. The overall percentage increase in average district scores from 1993 to 2001 is 88 percent (36.6 to 68.4 points) or an average of 11 percent for each year of accountability change. At first glance, this rather remarkable indicator of long-term improvement in district performance should be cause for celebration. Although not quite as strong as the performance of the American stock market in that same period, it still suggests a very positive long-term improvement in education performance. On the other hand, some critics might contend that the overall improvement in district performance in the 1990s was as ephemeral as the "new economy."

Neither the celebratory nor the critical perspective deserves unqualified support. As previous research on forecasting school accountability scores finds ("The KERA Endgame: Which Kentucky Schools Will Achieve Proficiency by 2014?" http://www.uky.edu/~proeder/keraweb.htm), and as Table 1 indicates, a substantial portion of the large increase in accountability scores occurred as a result of a major policy change implemented in 1999 when the KIRIS accountability system became the CATS accountability system. Subsequent adjustments to 1999 and 2000 scores made

in 2001 also contributed to the large gains at the end of the decade. Without these system changes, the overall improvement in performance over this decade is much less impressive. The potential impact of this system change on the proportion of schools and districts projected to reach the goal of 100 points by 2014 is discussed in more detail in the previous paper, but the bottom two rows of Table 1 show the unusually large absolute and proportional gain in accountability scores in 1999.

TABLE 1 DISTRICT ACCOUNTABILITY SCORES (1993-2001) *									
	1993	1994	1995	1996	1997	1998	1999	2000	2001
All Districts	36.6	42.1	45.4	43.8	48.4	47.8	64.7	66.5	68.4
Top 10th ('93)	45.9	51.1	54.2	51.4	57.0	57.2	76.7	77.4	79.0
Bot 10th ('93)	30.4	38.1	41.3	40.3	43.1	42.3	56.5	59.1	61.9
Gap	15.5	13.0	12.9	11.1	13.9	14.9	20.2	18.3	17.1
Maximum	64.5	63.2	64.5	62.0	71.0	68.4	96.0	99.2	98.1
Minimum	28.4	32.1	32.7	33.8	37.1	35.7	47.4	50.3	51.4
Ch pts/yr **		5.5	3.3	- 1.6	4.6	- 0.5	__16.9__	1.8	1.9
% ch/yr		16	8	- 3	11	- 1	__35__	3	3

* The total number of districts is 177. This total includes one school district (Richmond Model) that usually is not included in subsequent analyses because it is included in another school district except for separate test scores. The categories of top and bottom tenth (n=18 each) are based on scores in the first year of accountability carried through each succeeding year. Appendix A lists the top and bottom districts and their scores in 1993 and 2001.
** In 1999, the accountability system changed from KIRIS to CATS.

The top and bottom tenths of districts based on 1993 scores follow roughly the same patterns over time as all districts, except that the top performing group in 1993 tends to improve slightly less over time than the bottom group until 1997 when the mean score of the 1993 top group increases by almost 11 percent compared to the 6.4 increase of the 1993 bottom group. This shows that the initial low scoring districts after gaining some ground on the top scoring districts through 1996 began to fall behind in 1997 culminating in the largest gap of just over 20 points in 1999. After this large gap in 1999, the difference declines to 17 points in 2001, but the initial bottom group still remains on an absolute basis further behind the top group than in the first year of testing in 1993 (15.5 points). However, when the performance gap is compared to the overall gain in scores from 1993 to 2001 it is not so substantial. The gap is just over 50 percent of the average score of the bottom ten percent of districts in 1993, but it is only 27 percent in 2001, indicating that relative to the overall improvement in accountability scores, the gap between the lowest and highest scoring districts in 1993 has narrowed by 2001. This should be good news, especially for those concerned with questions of equitable excellence in public school performance.

ACCOUNTABILITY IMPROVEMENT: 1993-2001

This section addresses the question of which districts improved most and least over the period of testing. There are at least two ways to measure accountability improvement or gain scores – absolute and proportional. One reason for examining both these measures is the moderately strong correlation between the initial or benchmark score in 1993 and percentage change over time (r = -.50). Districts that scored high in 1993 tend to have lower percentage increases from 1993 to 2001. In contrast, the relationship between 1993 scores and absolute gain in scores is positive but much

weaker (r = .16), indicating that the high scorers in 1993 are not very likely to have higher absolute gain scores, but are much more likely to have lower percentage increases. Absolute and proportional gain scores both provide useful information about district accountability improvement, and both are examined here.

The mean gain score from 1993 to 2001 for 177 districts is 31.9 points (s.d = 4.8) with a minimum gain of 18 and a maximum of 48.7. The average proportional gain score is 88 percent (s.d. = .15) with a minimum percentage gain of 51 and maximum of 128 percent. Most districts fall within a fairly narrow range of gain scores - - 105 of 177 districts gain between 28 and 35 points; while 110 improve by 75 to 100 percent. Thirty-six districts gain more than 35 points from 1993 to 2001; while thirty-five districts more than double their initial 1993 scores in that period. The correlation between total gain scores and percentage gain scores (r = .76) indicates substantial overlap between the two measures – districts with higher gain scores also trend to have greater proportional increases. Although linear in form, a graph of the relationship shows that the relationship is somewhat stronger at the bottom (least improved) than the top (most improved) of the two scales.

Table 2 lists the most improved districts using both gain scores and percentage gain scores. These twenty districts not only gained more than 35 points (above the mean of 32 points), they also more than doubled their 1993 scores in the period 1993 – 2001 (above the mean of 88 percent). A graph of the relationship (r = .25) suggests that omitting Walton Verona with the highest gain score and the highest percentage increase in the group would substantially reduce the already weak correlation. Other than strong performance over time, there does not appear to be an obvious pattern in this top group that includes rural, independent, and Appalachian districts, except that only one of these most improved districts scored higher than 40 points in 1993 (Daviess County).

TABLE 2 MOST IMPROVED DISTRICTS 1993-2001 *			
District	Acct Sc 1993	Acct Sc 2001	Gain Score	% Change
SILVER GROVE IND	29.4	64.7	35.3	120
WOLFE CO	31.1	67.6	36.5	117
GRANT CO	31.7	70.7	39.0	123
GRAVES CO	35.7	75.3	39.6	111
ERLANGER-ELSMERE	35.9	76.2	40.3	112
HANCOCK CO	39.4	80.6	41.2	105
ROCKCASTLE CO	34.8	75.2	40.4	116
BOONE CO	38.1	77.8	39.7	104
BARREN CO	34.6	72.5	37.9	110
ANDERSON CO	35.2	76.1	40.9	116
BALLARD CO	33.6	69.4	35.8	107
BOWLING GREEN IND	35.1	75.2	40.1	114
LUDLOW IND	39.7	80.8	41.1	104
WALTON VERONA IND	38.0	86.7	48.7	128
MCLEAN CO	34.9	77.1	42.2	121
MONROE CO	31.8	68.4	36.6	115
DAVIESS CO	41.1	82.4	41.3	101
MUHLENBERG CO	34.9	71.8	36.9	106
PINEVILLE IND	31.5	68.1	36.6	116
GLASGOW IND	36.7	78.8	42.1	115
* These districts improved both absolutely by more than 35 points and proportionately by more than 100 percent.			

Table 3 lists the least improved districts using both gain scores and percentage gain scores. These twenty-three districts not only gained less than 28 points, they also increased their 1993 scores by less than 75 percent in the period 1993 – 2001. A correlation of .59 between the two measures of gain scores for the least improved districts (n =23) suggests a moderately close relationship at the bottom. As with the top group, there does not appear to be an obvious pattern in this bottom group that includes rural, independent, and Appalachian districts, however there are twice as many independent districts in the bottom than the top group. This consideration of groupings of districts leads to the next section and an examination and comparison of various groupings of districts.

TABLE 3 LEAST IMPROVED DISTRICTS 1993-2001 *				
District	Acct Sc 1993	Acct Sc 2001	Gain Score	% Change
WEST POINT IND	32.8	55.2	22.4	68
HARRODSBURG IND	37.9	64.6	26.7	70
SOUTHGATE IND	45.9	71.2	25.3	55
JACKSON IND	34.3	56.5	22.2	65
EMINENCE IND	41.0	65.8	24.8	60
FULTON IND	36.8	63.6	26.8	73
PENDLETON CO	39.6	64.9	25.3	64
LEWIS CO	38.4	63.7	25.3	66
ROBERTSON CO	35.8	61.2	25.4	71
GREENUP CO	39.8	60.0	20.2	51
PROVIDENCE IND	33.4	51.4	18.0	54
BELL CO	35.2	59.9	24.7	70
MONTICELLO IND	37.0	62.4	25.4	69
BEREA IND	42.0	69.0	27.0	64
ELLIOTT CO	36.3	59.2	22.9	63
SHELBY CO	39.8	67.2	27.4	69
SOMERSET IND	43.6	71.3	27.7	64
MARTIN CO	35.5	60.0	24.5	69
WASHINGTON CO	37.9	64.5	26.6	70
HENRY CO	41.4	65.7	24.3	59
FULTON CO	32.9	55.2	22.3	68
RUSSELLVILLE IND	41.7	68.5	26.8	64
ADAIR CO	38.1	66.0	27.9	73
* These districts improved both absolutely by less than 28 points and proportionately by less than 75 percent.				

PERFORMANCE OF REGIONS AND GROUPS OF DISTRICTS

The analysis of district performance over time in Tables 1 through 3 suggests that certain groups of districts might display significant or important differences in performance. One of the more interesting groups to consider includes the districts that comprised the Council for Better Education (CBE), the group of school systems that brought the suit that led to the 1989 Kentucky Supreme Court decision (Rose v. CBE, Inc.) that eventually led to legislative approval of KERA in 1990. Did the initiation of the successful legal/constitutional challenge and subsequent legislative action result in significant improvements in these mostly property-poor school districts, at least compared to the other districts?

Some contend that the primary accomplishment of the court case and subsequent policy change was to recognize and begin to correct the substantial inequities in funding and other areas of school district operations. This major change in school funding suggests that districts that were most disadvantaged prior to KERA also should have benefited by the reform. How have the districts most disadvantaged prior to KERA in 1990 (less money and less academic success) performed compared to the most advantaged districts? Although disadvantage is spread throughout the state, some social and economic data suggest that Appalachian or Eastern Kentucky has certain unique conditions that relate closely to economic underdevelopment or disadvantage and these conditions might have negative impacts on the school systems. Have KERA reforms helped improve performance of districts located in Appalachian Kentucky compared to the rest of the state? Finally, some contend that there also might be differences in performance between urban and rural school districts, and between independent and county districts. Differences in accountability scores among these district groupings on Kentucky's accountability index are presented in Table 4.

TABLE 4 DISTRICT ACCOUNTABILITY SCORES: REGIONS AND GROUPS (1993-2001) *								
	1993	1994	1995	1996	1997	1998	1999	2000	2001
All Districts	**36.6**	**42.1**	**45.4**	**43.8**	**48.4**	**47.8**	**64.7**	**66.5**	**68.4**
Advant (n=18)	41.6	48.0	51.3	49.2	55.2	55.1	74.6	75.5	77.8
Disadv (n=18)	33.6	39.0	42.0	40.0	43.8	42.8	58.2	60.3	62.8
Gap	**- 8.0**	**- 9.0**	**- 9.3**	**- 9.2**	**- 11.4**	**- 12.3**	**- 16.4**	**- 15.2**	**- 15.0**
CBE (n=64)	35.4	41.2	44.2	42.7	47.0	46.5	62.6	64.6	66.3
Non-CBE(n=112)	37.1	42.5	46.0	44.3	49.0	48.5	65.7	67.5	69.5
Gap	**- 1.7**	**- 1.3**	**- 1.8**	**- 1.6**	**- 2.0**	**- 2.0**	**- 3.1**	**- 2.9**	**- 3.2**
Appal (n=69)	35.4	40.6	44.4	42.8	46.4	45.6	61.8	63.9	65.9
Non-Appl(n=107)	37.2	43.0	46.0	44.3	49.5	49.2	66.4	68.0	69.9
Gap	**- 1.8**	**- 2.4**	**- 1.6**	**- 1.5**	**- 3.1**	**- 3.6**	**- 4.6**	**- 4.1**	**- 4.0**
Indep (n=56)	38.0	43.9	46.9	45.5	50.0	50.0	66.7	68.5	70.0
Non-Ind (n=120)	35.8	41.2	44.6	42.9	47.5	46.8	63.6	65.5	67.6
Gap	**2.2**	**2.7**	**2.3**	**2.6**	**2.5**	**3.2**	**3.1**	**3.0**	**2.4**
Rural (n=145)	36.1	41.5	44.7	43.2	47.5	47.0	63.6	65.4	67.3
Urban (n=31)	38.3	44.8	48.2	46.0	51.9	51.5	69.2	71.1	73.1
Gap	**- 2.2**	**- 3.3**	**- 3.5**	**- 2.8**	**- 4.4**	**- 4.5**	**- 5.6**	**- 5.7**	**- 5.8**

* The total number of districts is 176. The categories of advantaged (top 10th) and disadvantaged (bottom 10th) are based on factor scores for three variables – proportion of children eligible for free/reduced meals, state - local revenue per pupil in 1988, and academic success (proportion going to college and drop-out rate), therefore the calculations for the top and bottom ten percent advantaged/disadvantaged do not include the seven districts with no high schools. The category CBE is the Council for Better Education, Inc., the group of districts that brought suit against the state resulting in the Supreme Court decision leading to KERA. Appalachian districts are those in counties designated by the Appalachian Regional Commission. Independent districts are districts for cities within larger county districts, while non-independent districts are county districts. Rural districts are those in counties with less than 150 people per square mile.

Table 4 shows that differences in group performance are most pronounced for advantaged and disadvantaged districts. Disadvantaged districts begin with a substantially lower average score in 1993 and the gap increases from 8.0 to 16.4 points through 1999, when the gap decreases somewhat in 2000 through 2001 to 15 points. In comparison, none of the other group comparisons show gaps of more than 5.8 points

(the gap of urban over rural districts in 2001). One reason for the relatively larger gap for advantaged/disadvantaged groups is that these two groups are smaller samples at the extremes of the total population of districts, while the other comparisons include all districts split according to the stated criteria.

Table 4 compares several groupings or regions of districts on one measure of performance – accountability scores (based mostly on academic or subject matter tests) over time. Although overall accountability scores are important for assessing school and district performance, additional performance measures are available. These measures include attendance, retention, and dropout rates, and several indicators of student educational outcomes or transitions to adult life. The same groupings of districts from Table 4 are compared on these additional performance measures in five tables found in Appendix B. Table 5 summarizes the primary findings from the data in Appendix B.

TABLE 5 COMPARATIVE DISTRICT PERFORMANCE OF REGIONS AND GROUPS *					
	Attendance	Retention	Dropout	Trans/Coll	Unsuc/Tran
Disadvantaged	- - - -	+ + + +	+ + + +	- - - -	+ + + +
Appalachian	- - - -	- + + +	+ + + +	+ - = -	+ + + +
Rural	= - = -	+ + + +	+ + + +	- - - -	+ + + +
CBE	- + - -	= + + +	+ + + =	- - - -	+ + + +
Independent	+ + + +	- - - -	- - - -	+ + + +	- - - -
* The successive plusses or minuses indicate the years (94, 96, 98, 00) when the region or group surpassed or fell behind the overall district average. An equal sign indicates the group mean equaled the total district mean.					

With the exception of the advantaged/disadvantaged group comparisons (Appendix Table B-4), the differences between these groupings are not very large. Despite this one difference in magnitude, the patterns of differences are similar for disadvantaged, Appalachian, rural, and CBE districts. With a few exceptions, these four groups tend to have lower attendance rates, more retentions, more dropouts, fewer transitions to college, and higher percentages of unsuccessful transitions. The exception to the overall group pattern is that independent school districts have higher attendance rates and higher rates of transition to college and lower rates of retentions, dropouts, and unsuccessful transitions than county districts. Although one reason for the similar patterns is overlap among the groupings (for example, some Appalachian districts are also rural, disadvantaged, independent, and/or were members of the Council for Better Education), at the same time, there also is overlap with independent school districts, so other explanations for the differences must be considered.

Although the comparisons of regions and groups of districts in Tables 4 and 5 (and Appendix B) show differences in performance and some increases in these performance gaps over time, the significance or importance of these groupings will be examined below in multivariate models. Although the differences in performance among the groups may seem large or important, are the differences significant or meaningful after controlling for other district characteristics? Do these district groupings explain any variance in performance beyond factors such as poverty, size, teacher qualifications, revenues, bureaucracy and other district factors? This question will be explored below.

STABILITY IN ACCOUNTABILITY SCORES

The previous analyses of performance data suggest some stability in district performance, a finding confirmed by examination of correlations among accountability

scores found in Table 6. The lowest correlation between scores over the nine-year period is .68 (1993 and 1995), which still is moderately strong. Scores for 1996 through 2001 are related even more closely with correlations ranging from a low of .79 to a high of .96. The relative position of districts in overall performance does not change much in the nine-year period (especially after 1997) suggesting that few districts are improving or declining so much each year that they leap ahead or fall behind many other districts.

This relatively high level of stability suggests at least two inter-related implications – on the one hand the substantial stability in performance provides some evidence for the validity or reliability of the testing system (at least at the level of the school district), but on the other hand it also suggests that relatively stable characteristics of districts may be determining performance rather than changes in school and classroom practices and behaviors due to KERA. These factors could be social, economic, and cultural characteristics of communities that tend to be quite stable or characteristics of schools such as teacher experience and quality or the school organization or academic climate that are perhaps somewhat less stable but still difficult to change in the short-term.

	1993	1994	1995	1996	1997	1998	1999	2000
1994	.72							
1995	.68	.87						
1996	.72	.82	.86					
1997	.77	.81	.76	.84				
1998	.76	.79	.77	.84	.92			
1999	.80	.78	.79	.85	.88	.93		
2000	.76	.76	.77	.82	.88	.90	.96	
2001	.75	.74	.74	.79	.86	.91	.94	.96

TABLE 6
DISTRICT ACCOUNTABILITY SCORE CORRELATIONS *

* Product-moment coefficients. N = 177

A BRIEF LOOK AT SCHOOL DISTRICT FUNDING EQUITY

Before addressing district finances in the broader research context of attempting to explain district performance, it is important to note that a recent report sponsored by the Kentucky Department of Education assesses the equity of Kentucky's school funding mechanism over the past decade. The reform mechanism - the Support Education Excellence in Kentucky (SEEK) program was designed to address both the adequacy and equity of school funding. Picus, Odden, and Fermanich (POF) in a September 2001 report available online at the KDE website titled "Assessing the Equity of Kentucky's SEEK Formula: A Ten Year Analysis," http://www.kde.state.ky.us/odss/finance/seek.asp conduct extensive examinations of district financial data and conclude:

"In summary, there is a substantial degree of fiscal equity in Kentucky under the SEEK formula. Revenue per pupil differences are relatively small, and the link between property wealth and revenue per pupil is essentially gone. Although Kentucky policymakers should not become complacent about the equity of the system, it appears that at this time revenue inequities are not a problem for the state."

This conclusion regarding fiscal equity is important for several reasons, but primarily because the 1989 Kentucky Supreme Court decision leading to the adoption of KERA in 1990 called for a "substantially uniform" system of common schools that

provided an equal opportunity for every child to have an adequate education. "The children of the poor and the children of the rich, the children who live in the poor district and the children who live in the rich district must be given the same opportunity and access to an adequate education." (OEA, December 1991: 1) Data presented in testimony and hearings leading to legislative enactment of KERA illustrate the huge disparities in district fiscal resources prior to the 1990 reform. For example, in the period 1989/90, property wealth per pupil ranged from $39,138 to $341,707; local revenue per pupil ranged from $31 to $356; and per pupil expenditures for instruction ranged from $1499 to $3709 (OEA, December 1991: 3). These and other inequities led to the creation of the SEEK formula which is described in the 1991 OEA Report and the 2001 report by Picus, Odden, and Fermanich.

My previous analysis of Kentucky's school districts in Chapter 3 of Education Reform and Equitable Excellence (1999) http://www.uky.edu/~proeder/keraweb.htm focuses primarily on school district finance as it relates to models of district performance. The earlier analysis uses state and local revenue prior to the implementation of KERA (1988) and change in state/local spending per pupil from 1988 to 1991 in multivariate models and finds that despite the focus of KERA on closing the huge gap in revenues across districts, the measure of change in revenues due to KERA's financial reforms does not have any important impact on performance from 1993 through 1997. The 1999 book chapter also suggests that the greatest proportional increase in revenues due to KERA and SEEK occurred in the first few years of implementation, and finds that districts that received greater increases in funds in the early years of KERA did not perform at higher levels in this early implementation period. However in some models, state and local funding prior to KERA contributes to an explanation of performance on the accountability index – districts with higher levels of per pupil state and local revenue prior to reform do tend to perform at higher levels many years later controlling for other relevant variables.

Table 7 presents more extensive data on district finances than are examined in the 1999 book. These additional data show that the proportion of total per pupil revenue from local sources has increased steadily and substantially from 19 to 26 percent in the period 1991 through 1999, while the proportion of total revenue from the state has declined from 70 to 63 percent in this same period. This trend raises several questions and issues. If the primary goal of KERA and the SEEK formula is to use state funds to help reduce resource inequality across districts and improve public education in Kentucky's school systems, then this trend of relative decline in state funding might raise questions about commitment to that goal, or at least it raises questions about the impacts of the SEEK formula on both state and local tax systems.

Since a major impetus to comprehensive reform was the substantial disparity in wealth and resources across districts prior to the 1990 reform, comparing changes in state and local revenue before and after KERA is one way to begin to assess the impact of SEEK on school finances. For example, the proportional increase in local revenue per pupil from 1988 to 1991 is 59 percent compared to the increase of 33 percent in state revenue. This average yearly increase of approximately 20 percent per year for local revenue from 1988 to 1991 is almost double the approximately 10 percent per year increase in local revenue from 1991 to 1993. The average yearly increase for state per pupil revenue in the period 1988 to 1991 (11 percent) also is almost double that for state revenue from 1991 to 1993 (6 percent).

Following the earlier analysis in the 1999 book, the comparisons in Table 7 tend to confirm that the greatest financial impact of KERA and SEEK was in the earliest years of policy implementation. Since that initial period, with the exception of local revenue from 1995 to 1997, increases in local and state revenues have been moderate. Table 7

also shows that local revenues have increased at faster rates than state revenues with a very pronounced relative difference from 1995 to 1997 (37 percent local increase versus 8 percent state increase). However, after this very substantial percentage increase in local revenue from 1995 to 1997, the relative gap in gains in state and local revenue declines substantially in the period 1997 to 1999 (11 percent versus 9 percent).

TABLE 7 SCHOOL DISTRICT FINANCE (1991-1999) *					
	1991	1993	1995	1997	1999
Local rev /pupil	763	895	1082	1486	1651
State rev/pupil	2797	3131	3474	3766	4098
Total rev/pupil	4001	4567	5142	5892	6469
% local rev of total	19	20	21	25	26
% state rev of total	70	69	68	64	63
Total Exp/pupil	4194	4817	5432	5893	6398
% ch loc rev pp (91-93)		17			
% ch st rev pp (91-93)		12			
% ch loc rev pp (93-95)			21		
% ch st rev pp (93-95)			11		
% ch loc rev pp (95-97)				37	
% ch st rev pp (95-97)				8	
% ch loc rev pp (97-99)					11
% ch st rev pp (97-99)					9
* The total number of districts is 176. The data are not adjusted for inflation.					

Another way to assess change in district financial resources is to compare percentage increases in local (state) revenue from 1991 to 1999 for districts that had the lowest per pupil local (state) revenue in 1991 and districts with the highest revenues. Table 8 shows that the bottom 18 districts in local revenue in 1991 increased by 225 percent by 1999 compared to 84 percent for the top18 districts. The low revenue districts made much greater funding effort than the high revenue districts in this period. In contrast, the bottom 18 districts in state revenue increased only 34 percent in this period compared to 47 percent for the top 18 districts. This provides further evidence that local revenue has increased proportionately much faster than state revenue, especially for districts that had the lowest levels of local revenue in 1991. In contrast, those districts with the lowest levels of state revenue in 1991 increased more slowly than districts with the highest levels of state revenue per pupil in 1991.

TABLE 8 CHANGE IN STATE AND LOCAL REVENUE PER PUPIL: TOP AND BOTTOM DISTRICTS (1991-1999)		
	Bottom Tenth	Top Tenth
% ch local rev (91-99)	225	84
% ch state rev (91-99)	34	47
* The total number of districts is 176. The data are not adjusted for inflation. The Bottom Tenth includes the 18 districts with the lowest per pupil local (state) revenue in 1991; the Top Tenth includes the 18 districts with the highest per pupil local (state) revenue in 1991.		

Based on the data in tables 7 and 8, one might conclude positively that local communities have been making greater efforts to increase funding of their schools, or conclude negatively that state government is lessening its' commitment to funding public schools. However, to provide some perspective for this focus on percentage increases in funding, it should be noted that the level of per pupil state funding for education remains much higher than per pupil local funding – for example, $4098 versus $1651 in 1999. A ten percent increase from $4000 is substantially more money than an increase from $1600, and therefore perhaps much more difficult to provide in a highly contentious, larger and more diverse political arena, especially when the money will be redistributed from richer to poorer communities.

To this point the analysis of district revenues from state and local sources has assessed changes over time and although these changes have implications for funding equity they do not provide direct assessments of funding equity. The data seem fairly clear that local revenue has increased at a more rapid rate than state revenue, however the impact of this change on equity or the distribution of state and local revenues across districts has not yet been examined. To assess the distribution of revenue across districts or horizontal equity, Table 9 examines several measures of district revenue equity from 1988 through 1999 including the coefficient of variation and two additional measures used by POF (2001) - the McLoone index and the Verstegen index.

The coefficient of variation is a commonly-used statistical measure of dispersion about the mean - - the standard deviation is divided by the mean. With a range from 0 to 1, smaller c.v.'s indicate less dispersion or more equity while larger numbers indicate more dispersion or less equity. The third column of Table 9 shows that for the key indicator of district funding – total revenue per student, the c.v.'s are fairly small and stable with a range from .10 to .12 from 1991 through 1999. These numbers are similar to those of POF (Table 2, Set A) who find c.v.'s in the same range for several variations of revenue data based on Average Daily Attendance (ADA) in 2000. They find somewhat lower c.v.'s for revenue data that are adjusted or weighted for various factors such as types of students, transportation costs, and overall costs of education. Their analysis of these same equity measures over time finds similar results for the c.v. for total revenue based on ADA and weighted ADA as for total revenue per pupil in Table 9.

One question not examined in the POF (2001) equity analysis is the difference in distributions between state, local, and total revenues as measured by the coefficient of variation. As columns 2 and 3 in Table 9 demonstrate, although district revenues per pupil from the state are distributed almost identically to total revenues in 1991 (both c.v.'s = .10), the c.v. for state revenues begins to increase more than for total revenues in 1993 and increases to .16 compared to .10 for total revenues in 1999. Comparing state revenue per pupil in column 2 to local revenue in column 1 shows a much larger c.v. (.71) in 1988 prior to KERA that improves substantially to .58 in 1991 and eventually improves to .47 in 1999. As might be expected this indicates that local revenue per pupil is much more inequitably distributed than state or total revenue throughout this period, however local revenue inequity has decreased over the decade compared to the state distribution that has become somewhat less equitable and the total distribution that has remained stable and relatively equitable since 1991.

13

	Local Rev pp	State Rev pp	Total Rev pp
TABLE 9			
DISTRICT PER PUPIL REVENUE EQUITY (1988-1999)			
1988			
Coef of Variation	.71	.07	
McLoone Index	.68	.95	
Verstegen Index	1.80	1.06	
1991			
Coef of Variation	.58	.10	.10
McLoone	.70	.92	.94
Verstegen	1.60	1.08	1.08
1993			
Coef of Variation	.58	.13	.11
McLoone	.72	.90	.94
Verstegen	1.52	1.12	1.10
1995			
Coef of Variation	.59	.14	.12
McLoone	.76	.88	.92
Verstegen	1.56	1.10	1.10
1997			
Coef of Variation	.46	.15	.11
McLoone	.76	.88	.94
Verstegen	1.42	1.10	1.10
1999			
Coef of Variation	.47	.16	.10
McLoone	.76	.86	.94
Verstegen	1.44	1.12	1.10

The other two statistics used to measure equity in Table 9 (McLoone and Verstegen indices) examine separate halves of the distributions of the three variables in question (local, state, and total revenue per pupil). The McLoone Index is the ratio of the sum of the values of all observations below the median (50th percentile) to the sum of all observations below the median if they had the value of the median, while the Verstegen Index is the same for observations above the median (POF, 2001: 18-19). The McLoone Index ranges from 0 to 1 while the Verstegen Index has a value of 1.0 or greater. POF state that the higher the number or closer to 1.0 for the McLoone Index, the more equitable the distribution of bottom half of the population of districts and suggest a benchmark of .95 or higher is desirable. They state that a benchmark has not yet been established for the Verstegen Index, however all Verstegen values in their Table 2 are just slightly above 1.0.

As an example of how these two statistics are calculated, the median value for local revenue per pupil in 1988 (two years prior to KERA reforms) is $419, so the total for districts below the median if they all were at the median would be 419 x 88 or 36,872. The sum of all values below the median is 25,256 which divided by 36,872 is .68 - a moderate value of the McLoone Index (POF state that most values of the McLoone index are in the .70 to .90 range). This value of .68 indicates that local revenue is somewhat inequitably distributed for the bottom half or low revenue districts prior to KERA. For the Verstegen Index, the sum of all values above the median is 66,528 which divided by 36,872 is 1.80 or a relatively high value of the Verstegen Index indicating that local revenue for the high revenue districts is much more inequitably distributed than for the bottom half prior to KERA. Examining these two measures for local revenue in subsequent years shows that after KERA and SEEK implementation,

the distribution of local revenue for the high revenue districts becomes more equitable but remains high (from 1.80 in 1988 to 1.44 in 1999 on the Verstegen Index), while the distribution of local revenue for the low revenue districts (McLoone Index) increases slightly 1988 (.68) to 1999 (.76) indicating some improvement in equity, but still moderately inequitable.

The third column of Table 9 provides McLoone and Verstegen indices for total revenue per student which are comparable to those found in POF (2001). The data show that distributions for both low and high total revenue districts are quite equitable with McLoone values ranging between .92 and .94 and Verstegen values between 1.08 and 1.10. As a comparison, all McLoone values in POF are above .91 and all Verstegen values slightly above 1.04 for all measures of total revenue in their Table 2, indicating that both the low and high total revenue districts are quite equitably distributed in 2000. In addition, McLoone values for four different measures of total revenue per pupil from 1991 through 2000 in their Table 3 are all above .90. This brief analysis tends to confirm the much more extensive and detailed analysis of Picus, Odden, and Fermanich (2001) and their conclusion that "at this time revenue inequities are not a problem for the state."

Since this brief analysis as well as the more extensive analysis by POF (2001) concludes that funding equity no longer appears to be a major problem for public education in Kentucky, the almost decade-long decline in state funding relative to local funding no doubt is the reason why a new CBE coalition of school districts is initiating a campaign to assess the adequacy of state revenue for the public schools (Blackford, 2002a). Since all Kentucky school districts now have substantially equitable total revenues, the remaining issue is whether this level of resource commitment (even though now more equitably distributed) is "adequate" given the tasks and goals that have been mandated by KERA.

AN EVEN BRIEFER LOOK AT SCHOOL DISTRICT FUNDING ADEQUACY

If the concept of education funding equity is complex and contested, then the concept of funding adequacy may be even more so. According to Odden and Picus (2001: 3), the key question of adequacy is whether there is "sufficient funding for each school in the state to deploy powerful enough educational strategies to meet the state's 2014 goals, which are to have all students performing at or above the proficiency level on the state's student testing system." Linking the issue of funding adequacy to performance goals helps elevate the issue above the sometimes simplistic question of whether public school funding is keeping up with inflation, or the even more highly politicized question of whether primary and secondary education is receiving its fair share of the state budget compared to other important policy and program areas such as health care, law enforcement, transportation, and the like.

The political prominence of education funding adequacy is highlighted by the newly reestablished Council for Better Education (CBE). In referring to the 142 districts that now have reestablished the CBE, Blackford (2002a), who apparently is conveying the position of this group, states "they want answers about adequate funding, and once they get them, they will look for new answers to more funding – whether it's tax reform or another lawsuit." If accurate, this suggests that the CBE has already answered the question of adequate funding and is simply trying to decide whether to push for tax reform (presumably leading to more education funding from state government) or to initiate another lawsuit as the primary strategy to obtain increased funding for public schools. Kentucky's governor now agrees with these educators who are organizing a campaign for increased funding when he states that "economic equity" has been achieved, however "we have not yet achieved adequacy" (Blackford, 2002b). Although political opposition to this emerging political campaign has not yet surfaced and

education improvement remains a popular issue with the public, the governor and legislature have yet to agree on a budget for the current fiscal year and the political landscape in the state capitol may change after the November elections. The key political strategy of the education funding reformers appears to be the establishment of a strong linkage between improving public education (a relatively popular issue) and tax reform (a much less popular issue). As with most public policy issues, although fundamentally political in nature, education funding and state and local tax systems have several empirical and analytic components that likely will play prominent roles in the coming debate.

From a more analytical than political perspective, an official with the Education Commission of the States quoted by the Prichard Committee for Academic Excellence (2002) suggests four basic models are used to address funding adequacy – successful schools, professional judgment, whole schools, and statistical models. These four models appear to be very similar to four methodologies for determining school finance adequacy as described by Odden and Picus (2001) in a recent report to the KDE - economic cost function, identifying expenditure levels in districts/schools that meet performance benchmarks, professional consensus, and cost of effective school wide strategies (or state-of-the-art approach). As the name might imply, Odden and Picus provide an extensive, relatively clear explanation and rationale for the utility, effectiveness, and desirability of the state-of-the-art model.

Rather than a state-of-the-art or cutting-edge analysis, I will examine some limited but available data that might answer a few preliminary questions about funding adequacy and performance for Kentucky's school districts. I begin with the assumption that all adequacy models are based on the supposed existence of strong and independent relationships between education resources (essentially, tax revenue and the human capital, programs, and services it buys) and organization performance, and the further assumption that the forms or types of these resource-performance relationships may vary but ultimately are subject to both analysis by experts and manipulation by policy makers. After the true relationships between inputs and outputs (and outcomes) are identified by the experts, policy makers then can decide how to provide adequate monies to the programs and services that will achieve the desired higher levels of performance.

The contested or political nature of these assumptions is exemplified by the Coleman Report (1966) and the controversy that continues to follow this controversial government sponsored research project. Since at least the 1960s with the Coleman Report and continuing to the present, researchers have disputed the impact of school resources on achievement. In finding that student achievement is related strongly to family background and race controlling for several measures of school resources, the Report was interpreted by some to mean that "throwing money at problems" was of little value. Despite many criticisms of the Coleman Report, there is little empirical research demonstrating independent, strong, and positive relationships between school resources and performance. The conclusion about money and schools has been reinforced by Hanushek (1981, 1996) who reviews many studies subsequent to the Coleman Report and finds little or no relationship between school expenditures and student performance. Hanushek's conclusion is questioned by Hedges and his colleagues who find that increased school expenditures have significant, positive effects on student achievement (Hedges, Laine, and Greenwald, 1994; Hedges and Greenwald, 1996).

In some ideal policy world, there would be a close, positive (and perhaps linear) relationship between school revenue and performance. If this were the case, then the solution to the difficult and interrelated issues of education resource equity and adequacy would be relatively simple and easy – providing more money to the low

revenue and low performing schools or districts (they would be identical in this ideal world) would lead to improved performance. Unfortunately, as Table 10 suggests, the simple and easy solution appears to be neither valid nor feasible. Table 10 compares the performance of Kentucky's top and bottom eighteen districts based on their average CATS accountability score in 2000. As would be expected, the top performing districts have substantially higher average scores than the bottom performing districts as well as much higher scores than the mean or median districts. Despite this large gap in performance in 2000, the absolute and proportional changes in performance from 1999 to 2000 are quite similar for the two extreme groups with the bottom group actually improving at slightly higher levels from one year to the next. Relative to economies of scale issues, size does not appear to be a factor in this comparison as both the top and bottom groups have smaller enrollments (ADA) than the mean district, however both are larger than the median district. The large difference between the mean and median measure of district size reflects the highly skewed size distribution with many small districts in the state along with one very large district and several moderate-sized districts.

	CATS Top Tenth (n=18)	CATS Bottom Tenth (n=18)	District Mean*	District Median	District Range
	TABLE 10				
	DISTRICT REVENUE AND PERFORMANCE (1999-2000)				
CATS 2000	80.9	55.6	66.5	66.2	50.3 / 99.2
Change 99-00	1.83	2.01	1.81	1.70	-3.5 / +10.9
% Ch 99-00	2.0	4.0	2.9	2.5	-5.2 / +18.7
Size (ADA) **	2795	2404	3231	2114	150 / 80949
Local rev/pupil	2607	1191	1651	1504	634 / 7564
State rev/pupil	3351	4884	4098	4138	2190 / 5713
Total rev/pupil	6364	7099	6469	6332	5407 / 9879
Teacher salary	36431	34915	35173	35116	29908 / 42778
* The n for district mean, median, and range is 176.					
** The data for district size and revenues per pupil are for 1999.					

The most interesting comparisons in Table 10 are for the three measures of revenue per pupil. Although in 1999 the top-performing group on average has more than double the amount of local revenue than the bottom group, the bottom group has considerably more state and total revenue per pupil than the top group. At this stage in the analysis, If one were to consider funding adequacy as it relates to performance, these data suggest that the top performing districts already have adequate revenue (at least compared to the bottom group, if not in some absolute sense), however this adequate amount is somewhat less total revenue than the worst performing districts. Does this mean that the highest performing districts are doing a more effective job with less revenue (but still an amount adequate to their relatively exceptional performance) than the lowest performing districts? As a corollary, does this mean that the lowest performers are much less successful in using and applying their ample funds (at least more than the top performing group) to education programs and services? These questions suggest the difficulties in trying to link revenues or resources to education performance, which means difficulties in determining revenue adequacy.

Moving beyond revenue and considering what is purchased with education revenue, it is interesting also to note in Table 10 that although personnel expenses make up a significant proportion of district education spending, teacher salaries in the top and bottom groups are not much different. The average classroom teacher salary for the

bottom performing group is very close to the mean and median district salary, while the top group is somewhat higher. This suggests that if the top performing districts have better teachers (an interesting research project) and this teaching excellence helps explain their superior performance, then teacher salary (a key educational resource) may not be a crucial factor in explaining the performance differential.

These limited data on resources or revenues are only suggestive, but they call into question the assumption that the relationship between revenue and performance is simple or unambiguous. However, even if the various funding adequacy models proposed by education finance experts find significant, positive relationships between resources or inputs and performance (outputs or outcomes), a sound research design would control for other potential determinants or test for plausible alternative explanations for performance proficiency or excellence. But again, this brief look at revenue and performance finds that the least successful districts have more revenue per pupil than the most successful districts. Despite this seemingly clear finding, a major issue highlighted by these comparisons is the difference between local and total revenue as each variable relates to performance. This difference suggests the need for further examination of the relationships between various measures of resources and performance for all districts in Kentucky.

The data in Table 10 imply that the simple correlation between total revenue per pupil and performance on the CATS accountability scale is negative (high scorers have less total revenue), while the correlation between local revenue per pupil and performance is positive (high scorers have more local revenue). The data for all districts support these two hypotheses. The simple correlation between district local revenue per pupil and CATS score in 1999 is .56 (n=176), and the correlation between total revenue and CATS score is -.26 (n=176). Higher scoring districts have somewhat lower total revenue per pupil but higher local revenue per pupil than lower scoring districts. To complicate the revenue-performance relationship even more, there is one unusual district that might be called an outlier in that it has both the highest CATS score and highest local revenue (Anchorage Independent District in Jefferson County). If this one district is omitted from the analysis, the correlation between local revenue and CATS score drops somewhat from .56 to .48 (n=175) however the correlation between total revenue and CATS score becomes even more strongly negative (r = -.44, n=175).

In order to examine possible relationships between revenue and performance both over time and for districts using other measures of performance (gain scores and proportional change from 1993 through 2001), Table 11 examines revenue change over time for the most and least improved districts from Tables 2 and 3 above. The data show that the districts that improved least from 1993 through 2001 had much less local revenue per pupil in 1990 and 1999 but had greater proportional local revenue increases in that period than the most improved districts. In contrast, the least improved districts had almost identical total revenue as the most improved (3364 versus 3326) in 1990, slightly more total revenue in 1999 (6589 versus 6234) and a somewhat higher rate of total revenue increase than the most improved districts (96 versus 87 percent).

As these comparisons of the least and most improved districts suggest, for all districts the correlation between percentage change in total revenue per pupil (1990-1999) and percentage change in accountability score (1993-2001) is -.05, and the correlation between change in local revenue per pupil and change in accountability for these same time periods is .01. These weak coefficients indicate that proportional improvement in district accountability scores has little or no relationship to proportional increases in local and total revenue per pupil.

18

	TABLE 11 REVENUE FOR MOST AND LEAST IMPROVED DISTRICTS *	
	Most Improved (n=20)	Least Improved (n=23)
loc rev pp 1990	720	542
loc rev pp 1995	1167	955
loc rev pp 1999	1754	1429
% ch loc rev 90-99	144%	164%
total rev pp 1990	3326	3364
total rev pp 1995	4990	5258
total rev pp 1999	6234	6589
% ch tot rev 90-99	87%	96%
* These two groups of districts are from Tables 2 and 3 above. The most improved districts improved both absolutely by more than 35 points and proportionately by more than 100 percent from 1993 through 2001. The least improved districts improved both absolutely by less than 28 points and proportionately by less than 75 percent from 1993 through 2001.		

Finally, in contrast to the weak, negative relationship between total per pupil revenue and accountability scores in 1999 (r = -.26), the relationship between average teacher salaries, a major organizational cost, and accountability scores in 1999 is also weak, but positive (r =.27). This comparison of simple correlations seems to pose a contradiction in that providing more total revenue may not improve performance or actually could reduce it, however raising teacher salary (a basic expense category and key human education resource) could slightly improve district performance. The key to the possible contradiction may be found in assessing these resource variables in multivariate models of district performance.

The point of this brief analysis of revenue adequacy is that assertions about the impacts of education revenue/resources on organization performance must be examined with some care and in some detail. The next section examines certain district resources, primarily teaching resources, that are purchased by education revenue and might mediate the revenue-performance relationship. What quantity and quality of educational resources are purchased by tax revenues and which of these resources might or might not be amenable to monetary incentives? Which education resources have a reasonably clear relationship to money and which do not and how do these various resources relate to student and school performance? The next section examines additional data on financial and teaching resources.

DISTRICT FINANCIAL AND TEACHING RESOURCES

Along with several other states seeking greater accountability and transparency in public schooling, Kentucky has begun collecting and distributing more data from schools and school districts, much of which is now presented to the public in what are called Report Cards. A previous report examined data from 1999/2000 School Report Cards for urban schools in Jefferson and Fayette counties (Roeder, July 2001). http://www.uky.edu/~proeder/keraweb.htm For these urban schools, multivariate models using data from the 2000 School Report Cards find that more teaching resources (teachers with masters degrees) and increased parental involvement predict to higher levels of school performance controlling for poverty and other school characteristics.

Although previous studies of school district performance examine several components of what some might label school resources, the availability of more information in the District Report Cards beginning in 2000 allows further exploration of the impact of district resources on performance. The section of the Report Card on the

"Learning Environment" provides spending per pupil and student/teacher ratio, indicators used in much previous research. District spending is an obvious organizational resource in that more money allows the district to acquire more teachers, aides, educational equipment, supplies, and related instructional materials and facilities. Student/teacher ratio also is a teaching or learning resource in that the more teachers per student, the more likely that students will have greater access to teachers, classes will be smaller, and presumably the learning environment will be enhanced. It is also likely that these two indicators are related negatively in that having fewer students per teacher should increase costs.

Additional indicators of district resources relate to qualifications of classroom teachers. Four indicators of teacher qualifications from District Report Cards will be used in this research: (1) percentage of classes taught by teachers with a masters degree or greater or the equivalent, (2) percentage of classes taught by teachers with a major or minor or equivalent in the subject being taught, (3) percentage of classes taught by teachers with subject matter professional development, and (4) average teacher salary. These measures can be conceptualized as teaching resources in that the higher the salary of classroom teachers, the greater the proportion of classes taught by teachers with a masters degree or higher, and the greater the proportion of classes taught by teachers with a major or minor in the subject being taught or content professional development, the more likely that teaching resources will be knowledgeable, experienced, and effective (and by extension, school or district performance will be high). Before testing the hypothesis that resources affect district performance positively, the variables are summarized in Table 12. The table also includes several measures of district revenue discussed in the previous sections on equity and adequacy, and includes data from the early 1990s for all the variables to show changes in resources over time. The measure of teacher qualifications from the early 1990s is proportion of teachers certified as Rank II in 1992.

Reflecting the infusion of additional money into Kentucky's school system due to KERA, all the spending and revenue measures increased from the early 1990s to the end of the decade and classroom teacher salaries and student/teacher ratios also improved from the early implementation of KERA. Average teacher salaries increased 39 percent (not controlling for inflation) and remained relatively equitably distributed (c.v. = .05) from 1990 to 2000. The ratio of students per teacher improved from 17.1 to 16.4 from 1992 to 2000, and the coefficient of variation also improved from .21 to .10 indicating a more equitable distribution of this key instructional resource.

	Mean	S.D.	Min	Max	Skew	C.V.
TABLE 12						
DISTRICT FINANCIAL AND TEACHING RESOURCES *						
Tch salary '90	25385	1296	21718	30380	.82	.05
Tch salary '00	35173	1902	28908	42778	.22	.05
Stdnt/tch ratio '92	17.1	1.47	11.8	23.4	.09	.21
Stdnt/tch ratio '00	16.4	1.65	11.0	21.0	-.15	.10
% tchrs rank II '92	80.2	5.76	61.5	95.1	-.37	,07
%tchrs masters '00	74.8	8.43	38.0	99.0	-.86	.11
%tchrs maj/min '00	95.3	8.00	50.0	100	-3.32	.08
%tchrs prof dev '00	96.2	10.2	35.0	100	-3.80	.11
Sp/pupil '92	3593	370	2532	5613	1.69	.10
Sp/pupil '00	6099	932	1084	10570	-.31	.15
Loc rev/pup '90	610	429	142	3717	3.00	.70
Loc rev/pup '99	1651	770	634	7564	3.16	.47
St rev/pup '90	2286	166	1751	2753	.16	.07
St rev/pup '99	4098	646	2190	5713	-.38	.16
Tot rev/pup '90	3299	387	2591	5506	1.97	.12
Tot rev/pup '99	6469	656	5704	9879	1.34	.10
* The revenue and spending figures are not adjusted for inflation						

The four measures of teacher qualifications – proportion of teachers with Rank II certification in 1992, percentage of classes taught by teachers with a masters degree or greater or the equivalent in 2000, percentage of classes taught by teachers with a major or minor or equivalent in the subject being taught and percentage of classes taught by teachers with content professional development in 2000 all indicate reasonably high levels of teacher qualifications (75 to 96 percent) as well as relatively equitable distributions of these groups of teachers (c.v.'s from .07 to .11). The next question to be answered relates to interrelationships among these key resource variables.

There are many correlations for financial and teaching resources provided in Table 13, but the few to note in 1999 and 2000 are mostly as expected. For example, average teacher salaries in 2000 are moderately and positively related to the proportion of classes taught by teachers with masters degrees or higher (r =. 52) and with local revenue per pupil (r = .40), but related only weakly to total revenue per pupil (r = .10). Student/teacher ratio in 2000 is related moderately and negatively to spending per pupil. The correlation of -.49 indicates the fewer students per teacher, the more spending per pupil). Student/teacher ratio also is related negatively to state revenue per pupil (r = -.40) and total revenue per pupil in 1999 (r = -.58) indicating that more students per teacher relates to less revenue and spending per pupil, or conversely, the fewer students per teacher, the more costly the educational programs and services.

As expected, spending per pupil in 2000 is related moderately and positively to state revenue (r = .34) and total revenue (r = .68), but not to local revenue per pupil in 1999. Finally, note that local revenue per pupil in 1999 is very highly correlated with local revenue in 1990 (r = .90) indicating that the high local revenue districts tend to remain so over the decade, and total revenue per pupil in 1999 is moderately related to the same measure in 1990 (r = .62) also indicating some stability in total revenue over time.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 tch sal 90	-													
2 tch sal 00	.40	-												
3 st/tch 92	.05	.16	-											
4 stds/tch 00	.01	.13	.53	-										
5 tchr rll 92	.58	.13	-.03	-.01	-									
6 tchrms 00	.02	.52	.03	-.04	.14	-								
7 tchrmm 00	.15	-.01	-.22	-.07	.09	-.10	-							
8 sp/pup 92	.31	.06	-.59	-.46	.21	-.12	.08	-						
9 sp/pup 00	.08	.08	-.22	-.49	.05	-.00	-.08	.39	-					
10 lrevpp 90	.65	.38	-.12	-.05	.40	-.08	.16	.50	.12	-				
11 lrevpp 99	.62	.40	-09	-.01	.39	-.04	.12	.48	.10	.90	-			
12 srevpp 90	-.24	-.43	-.41	-.33	-.04	-.10	-.01	.27	.24	-.43	-.47	-		
13 srevpp 99	-.55	-.31	-.19	-.40	-.37	.04	-.16	.01	.34	-.65	-.75	.62	-	
14 trevpp 90	.51	.16	-.46	-.33	.37	-.06	.18	.74	.39	.73	.60	.20	-.17	-
15 trevpp 99	.07	.10	-.43	-.58	.04	.03	-.06	.66	.68	.25	.24	.31	.43	.62

TABLE 13
DISTRICT FINANCIAL AND TEACHING RESOURCES CORRELATIONS (N=176)

Before assessing resource measures in more extensive multivariate models of district performance, I present a simple model that regresses district performance in 2000 on several of these indicators of district resources. Specifically, the CATS accountability score (2000) is regressed on both local and total revenue per pupil (1999), spending per pupil, average classroom teacher salary, student teacher ratio, proportion of teachers with masters and higher, and proportion of classes taught by teachers with a major or minor in the subject area (all are from 2000 Report Cards), and the results are as follows:

CATS 2000 = 90.8 intercept + .006 locrevpp* - .005 ttlrevpp* + .000 tchrsal + .083 tchrmastrs
       (7.4)   (9.8)   (5.3)   (1.0)   (1.4)

    - .077 tchrsmaj/min - .631 studnts/tchr* - .000 spend/pupil
       (1.5)   (2.0)   (0.4)

Adj R^2 = .46
F = 22.4
Mean VIF = 1.75

The model with unstandardized partial regression coefficients (t-scores greater than 2.0 in parentheses below the coefficients indicates significance at least at the .05 level) shows that the two measures of revenue per pupil are significant predictors of performance with signs in the expected directions (positive for local and negative for total) followed by student teacher ratio (fewer students per teacher predicts to higher scores) with none of the other resource measures significant. As suggested by the bivariate correlations in Table 13, there is little evidence of multicollinearity in this simple model. Two related statistics - tolerance and VIF, both of which are derived from regressing each independent variable on all the other independent variables, can be used to assess multicollinearity (Garson, N.D.). Tolerance is defined as 1-R^2 for the regression of one independent variable on the others in the model, so when tolerance is close to zero there is high multicollinearity of that variable with the others and the regression coefficients will be unstable. The variance-inflation factor or VIF is the reciprocal of tolerance and so high values indicate high multicollinearity. Garson suggests that a VIF >= 4 is an arbitrary but common standard for high multicollinearity in

that the standard error of the coefficient is doubled when VIF is 4.0 and tolerance is .25. Since no individual VIF is greater than 2.5 and the mean VIF is only 1.75, multicollinearity is not an obvious problem with this model.

The primary substantive finding from this simple model is that from an array of measures of resources, local revenue per pupil predicts strongly and positively to accountability scores, while total revenue per pupil predicts strongly and negatively to accountability scores in 2000. For the next section dealing with more complex multivariate models, the primary finding from this initial model of resources and performance is that although inter-related mostly in expected ways, the indicators of financial and teaching resources are not so closely related that they are likely to cause multicollinearity problems, however some of the resource measures are likely to be closely related to other district characteristics such as proportion of children eligible for free or reduced meals possibly causing problems for model estimations.

DETERMINANTS OF DISTRICT ACCOUNTABILITY SCORES

The first tests of the determinants of district performance will be successive cross-sectional regression models using district accountability scores as the dependent variable. Weighted least squares regression is used since the observations (districts) are averages of groups that differ in size (most Kentucky districts are small, but one is quite large and several are moderately large). The standard correction for this heteroskedasicity is to weight the observations by the square root of size (Ferguson and Ladd, 1996: 282; Hanushek and Jackson, 1977: Chapter 6, especially section 6.6). With these models, I use the square root of ADA in each district as the weighting variable for each accountability year. The models are similar to those from Chapter 3 in the 1999 book, with the addition of data for 1999, 2000, and 2001, and several changes for the 2001 model. Table 14 presents results of regression models for the odd-numbered years 1993 through 2001 and 2000.

Because of missing data, or at least data that are not readily available from the Kentucky Department of Education or other sources, several predictors are used somewhat differently in each of the successive models. Poverty is defined as proportion of students eligible for free or reduced meals and this measure in 1992 is used for the 1993 and 1995 models. The other accountability models (1997, 1999, and 2001) use the same year for proportion of students eligible for subsidized meals as for the accountability score. District poverty is quite stable over time as indicated by the correlations for each of these years, all of which are above .90, which is the correlation of the poverty rate for 1992 with 2001. Poverty is a relatively stable characteristic of communities.

Size is average daily attendance (ADA) for each accountability year except for 2000 and 2001 that use 1999 ADA. Teacher qualifications is used in the 1999 book and is defined as proportion of teachers in 1992 classified as Rank II. This measure is used for all the models except 2000 where I use proportion of classes taught by teachers with subject matter professional development and 2001 where I use a composite measure of "teaching resources" that simply adds three measures of teaching resources from the 2000 District Report Cards and divides by three - - (1) proportion of teachers with a masters plus or the equivalent; (2) proportion of classes taught by teachers with a major or minor in the subject being taught; and (3) proportion of teachers completing subject matter professional development that year. The average proportion of these three measures should be a rough indicator of teaching resources or qualifications. These indicators of teacher qualifications do not seem to be available prior to 2000.

Another measure that could be considered both a teaching resource and a financial resource is average classroom teacher salary. This predictor variable is

available yearly and is used for each model until 2001. As might be expected, average teacher salary is strongly correlated from one year to the next, but over time the correlations weaken. For example, the correlation for 1991 and 1992 teacher salaries is .90, while the correlation of 1991 with 2001 is only .51. Since teacher salary has no independent effects in any of the models from 1993 through 2000, it is dropped from the analysis to be replaced by the teaching resource composite measure described previously and another factor labeled "financial resources." In the 2001 model, factor analysis is used to derive the variable financial resources which is factor scores based on two variables - - spending per student and the student teacher ratio, both from the 2000 District Report Cards.

In addition to these composite measures, a single indicator of financial resources is total revenue per pupil that is used in each model except for 2001 where I substitute the factor scores for the composite variable labeled financial resources. Another indicator of financial resources is derived from total revenue per pupil - percentage change in total revenue per pupil. For each model, change in total revenue is measured as the proportional change from 1990 to the accountability year. For example, the change in total revenue for the 1999, 2000, and 2001 models is total revenue per pupil in 1999 minus total per pupil revenue in 1990 divided by total revenue per pupil in 1990. Change in total revenue for 1997 is total revenue per pupil in 1997 minus total per pupil revenue in 1990 divided by total revenue per pupil in 1990, and so on for 1995 and 1993.

Finally, I include four predictor variables described in more detail in Chapter 3 of my 1999 book. "Competition" is a dummy variable that measures whether there is at least one private school in the district that might offer some competitive pressure on the public school district and thereby lead to improved performance. The variable labeled "accountable-communal schools" measures the degree to which districts were early adopters of Family Resource and Youth Services Centers (FRYSCs) and Site Based Decision Making Councils. It is hypothesized that districts with higher proportions of accountable-communal schools in 1993 (early adopters of these innovations) will achieve at higher levels. "Bureaucracy" is another composite measure derived from three variables from the early 1990s - administrators per school, administrators per teacher, and spending per pupil for administration. To control for academic disadvantage and the extent to which a district began the reform process with a strong academic culture, I include a variable labeled "previous academic achievement" in the models. The variable is derived by combining two separate but related indicators of academic performance - the percentage of high school graduates in a district entering college in 1992 and the percent of ninth-graders who completed high school, also in 1992 (the two percentages are added and then divided by 2). The only drawback to this measure is that seven small school districts in Kentucky have no high schools, therefore no students to complete high school or attend college, at least from those districts. This variable will have missing data for those seven districts.

Table 14 shows that the models are moderately successful predictors of district academic performance with relatively large adjusted R^2s, significant F-tests, and little or no evidence of multicollinearity (average VIF scores are all < 2.0). Comparing coefficients for the predictors finds that higher scoring districts are significantly more likely to have smaller proportions of poor children, be smaller in size, and to have had higher academic achievement or success prior to initiation of KERA reforms.[1] The coefficients for these predictors are significant and in the hypothesized direction for all models (with the exception of size in 1995).

TABLE 14
DETERMINANTS OF DISTRICT ACCOUNTABILITY SCORES: 1993-2001

PREDICTORS *	1993	1995	1997	1999	2000	2001
Size (x100)	- .004 (2.0)	- .004 (1.4)	- .009 (4.3)	- .011 (4.0)	- .012 (4.0)	- .008 (3.6)
Poverty	- .057 (3.0)	- .078 (3.3)	- .180 (7.4)	- .233 (7.1)	- .209 (6.1)	- .201 (6.5)
Teacher qual	.077 (1.7)	.099 (1.6)	.096 (1.9)	.140 (2.1)	.070 (2.1)	
Competition	- .702 (1.4)	.407 (0.6)	- .618 (1.1)	- .490 (0.7)	-.184 (0.2)	.130 (0.2)
Acct-comm scls	- .625 (0.8)	- .744 (0.7)	- 1.83 (2.1)	- 2.57 (2.3)	- 1.73 (1.5)	- 1.67 (1.4)
Bureaucracy	- .572 (2.2)	- .372 (1.0)	- .294 (1.0)	- .717 (1.9)	- .897 (2.3)	- .972 (2.6)
Prior acad achiev	.162 (5.3)	.104 (2.4)	.124 (3.6)	.150 (3.3)	.187 (4.0)	.180 (4.0)
Teacher salary	-.000 (0.5)	.000 (0.2)	.000 (0.7)	.000 (0.9)	.000 (0.9	
Total rev pp	.001 (1.0)	-.001 (0.7)	.002 (3.7)	.001 (1.6)	.001 (1.6)	
%ch total rev pp	-3.9 (1.6)	- 3.2 (1.4)	- 3.4 (2.0)	- 4.8 (2.2)	- 5.6 (2.6)	- 5.7 (2.6)
Finan resrces (fs)						- .538 (1.5)
Teach resrces (fs)						.127 (2.2)
Intercept	24.0 (4.3)	37.6 (4.6)	27.1 (3.9)	46.5 (5.0)	49.2 (5.5)	61.7 (9.0)
Adjusted R^2	.47	.38	.60	.66	.63	.63
F	15.6	11.3	25.7	34.0	29.1	32.8
N **	169	169	169	169	169	168
VIF	1.81	1.76	1.81	1.84	1.81	1.55

* Estimated using weighted least squares. The top figure is the unstandardized regression coefficient with the t-scores in parentheses. Although these data are not samples, t-scores provide an indication of relative importance. T-scores above 2.5 are significant at least at the .01 level; scores above 2.0 are significant at least at the .05 level; and scores above 1.7 are significant at least at the .10 level (all are two-tailed).

** Although the total number of school districts in Kentucky is 177, with these multivariate models only 169 districts are used. Seven districts have missing data for the measure of previous academic achievement because they have no high schools therefore they have no data for high school graduation rates or ninth grade students attending college. The eighth missing district is affiliated with a local university and although it has separate accountability scores, all other data are included in the county district where they are located. For the 2001 model, an additional district had missing data on the 2000 District Report Cards.

In addition to statistical significance, the substantive importance or relative contribution of these determinants to the model can be assessed by comparing the size of the partial slopes or regression coefficients for each predictor variable for each model year. Partial slopes indicate the average change in accountability scores associated

with a unit change in a predictor variable holding the other variables in the equation constant. For example in Table 14, the impact of poverty and previous academic achievement on 1997 accountability scores can be assessed and compared. A ten percent decrease in the poverty rate for a district (partial slope = -.18) is associated with a 1.8 point increase in accountability score, while a ten percent increase in previous academic achievement (partial slope = .12) is associated with a 1.2 point increase in that same score. Holding the other predictors constant, a district with a poverty rate of 20 percent would be expected to score 5.4 points higher than a district with a poverty rate of 50 percent (mean poverty rate for the districts in 1997 is 49 percent with a range of 1 to 88 percent). A ten percent decrease in poverty combined with a ten percent increase in previous academic achievement is associated with an increase in accountability of 3.0 points. Given that the mean district accountability score in 1997 is 48.4, the three-point effect of moderate differences in poverty and previous academic success is quite substantial. Put another way, a school district with 30 percent poverty and 80 percent previous academic success would be expected to score 3.0 points higher than a district with 40 percent poverty and 70 percent previous academic success.

In comparison, the impact of teacher qualifications on 1997 scores, although positive and almost significant, is small. The partial slope of .01 indicates that controlling for other variables in the model, a ten percent increase in teachers with Rank II certification in a district is associated with only a tenth of a point increase in accountability scores. It appears that increasing teacher qualifications (higher certifications) would have only a limited impact on accountability scores. This same measure is a significant determinant in the 1999 model and the different measure of teacher qualifications or resources used in the 2000 model - proportion of teachers completing subject matter professional development that year, also is significant with a partial slope of .07 (t score = 2.1)

Three indictors of district resources - average teacher salary, total revenue per pupil, and percentage change in total revenue per pupil (and the composite measure of financial resources used in 2001) do not perform consistently well in the multivariate models. Teacher salary has no significant impact on accountability performance in any of the models suggesting caution about claims that higher salaries are needed to attract "better" teachers, presumably leading to more learning and stronger organizational performance. Although there is no way to systematically assess what might have happened to district performance over the past decade if major investments had not been made to increase teacher salaries across the state, these models suggest that increased spending on teacher salaries (a major component of "adequate" resources) has no discernible positive impact on district performance. Some might argue that salaries have no impact on performance because teacher pay is not tied sufficiently to performance, therefore in order to impact performance positively, investments in salaries should be linked to pay for performance systems. Some experiments in pay-for-performance might be useful in helping to assess this issue.

In comparison to teacher salaries, a much broader measure of financial resources - total revenue per pupil, with a partial slope of .002 (t = 3.7) is significant only in the 1997 model, again suggesting that financial resources have little or no independent relationship with performance. If total revenue has little independent impact on performance, perhaps change in total revenue is an important determinant. Based on the assumption that increased revenue = higher performance, one might hypothesize that districts that had proportionately greater increases in total revenue would display stronger accountability performance. Unfortunately, this hypothesis is not supported by the data. Although percentage change in total revenue per pupil is significant in the four models from 1997 through 2001, the signs are negative indicating that holding the other

variables constant, districts with greater proportional increases in total revenues have lower accountability scores. This seems counterintuitive, however recall from Table 10 comparing the top and bottom performing districts in 2000 that although the top-performing group has more than double the amount of local revenue per pupil than the bottom group, the bottom group has considerably more total revenue per pupil than the top group. This suggests that redistribution of revenue from the state has yet to overcome the negative effects of community disadvantage and district poverty.

Just as with poverty and previous academic achievement, the impact of financial resources on 1997 scores can be assessed and compared. The partial slope of .002 for total revenue per pupil indicates that an increase of $100 is associated with a .2 point increase and $500 is associated with a 1.0 point increase in 1997 accountability scores. Since total revenue per pupil in 1997 ranges from $4730 to $9825 with a mean of $5892, a district with $6400 in total revenue per pupil (about $500 more than average) would be expected to score 1 point higher than the average district, holding the other variables constant. A district at the bottom of the revenue scale ($4730) would be expected to score about 2.4 points less than the average district ($5892) and 10 points less than the district that had $9825 in total per pupil revenue. In contrast, the partial slope for percentage change in total revenue per pupil from 1990 to 1997 is - 3.4 indicating that a revenue increase of 1 percent is associated with a .03 point decrease in 1997 scores. A district that had a total per pupil revenue increase of 50 percent from 1990 to 1997 (the district mean increase in this period is 80 percent) would be expected to score about 1.5 points higher than a district that had a revenue increase of 100 percent. Since the range in percentage change in total revenue per pupil from 1990 to 1997 is 33 to 146 percent, the district with the lowest proportional increase would be expected to score about 3.4 points higher than the district with the greatest increase. This comparison suggests that any initial disadvantage existing for some school districts based on lack of financial resources is not simply or easily overcome by increases in revenues. The models suggest further that even a substantial increase in total revenues to weaker performing districts might have little positive impact on performance, at least in the short-run because of other factors that impact performance negatively.

Bureaucracy is significant in three models and close to significance in a fourth (1999) indicating that beyond district size and other relevant factors, the more bureaucratic a district, the weaker its performance. Reducing the number of administrators and administrative costs might help improve performance. That district bureaucracy is not much related to district size is evidenced by the bivariate correlations of the bureaucracy factor with ADA in 1991 and 1993 ($r = -.21$ for both). Competition from the private sector has no significant impact on accountability performance in any of the models, and the measure of accountable-communal schools is significant in two models but the sign is not in the hypothesized direction. Dummy variables for four of the groups of districts described in table 4 - - CBE, Appalachian, rural, and independent were entered in all the models in table 14 and none were significant indicating that there are no important differences in the accountability performance of these groups when controlling for the district characteristics used in the multivariate models.

To summarize this analysis of accountability scores, just as in the earlier study in Chapter 3 of the 1999 book, smaller school districts with less family poverty and higher levels of academic achievement prior to KERA (less disadvantage) perform consistently at higher levels in the period 1993-2001 controlling for other plausible predictors of performance. Measures of financial and teaching resources have much less consistent and significant impacts on accountability scores

DETERMINANTS OF OTHER DISTRICT PERFORMANCE MEASURES

The previous models examine one measure of performance over time - district accountability scores based on various subject matter tests administered to different grades each school year. This section examines three additional measures of performance for districts in 1997 and 2000 - - dropout rate, proportion of graduates transitioning to college, and proportion of unsuccessful transitions. The models use the same determinants as in Table 14.

Table 15 shows that, although not quite as consistent and strong as in the models for accountability scores, the models for these other measures of performance are moderately successful predictors of district academic performance with adjusted R^2s somewhat weaker than for accountability scores but still with significant F-tests, and little or no evidence of multicollinearity (average VIF scores are all < 2.0 except for transition to college in 1997).

As with accountability scores, comparing coefficients for the predictors finds that with few exceptions, higher performing districts [lower dropout and unsuccessful transition rates and higher rates of transitions to college recognizing that there is disagreement over whether high rate of transitions to college is necessarily an indicator of "success"], are significantly more likely to have smaller proportions of poor children, be smaller in size, and to have had higher academic achievement or success prior to initiation of KERA reforms (except for unsuccessful transitions). The coefficients for these predictors are significant and in the hypothesized direction for most models.

Financial and teaching resources tend to be much more modest and inconsistent predictors. Teacher salary is significant only for 1997 dropout rates (higher salaries predict to lower rates); total per pupil revenue is significant only for college transition in 1997 (higher revenue predicts to higher rates); bureaucracy is significant only for 1997 dropout rates (more bureaucracy predicts to lower dropout rates). Proportional change in total per pupil revenue over time is significant for unsuccessful transitions in 2000 (greater change predicts to higher rates of unsuccessful transitions), and almost significant for college transitions in 1997 (higher proportions of revenue change predicts to lower rates of transitions to college). The composite measures of financial resources and teaching resources described above are not significant in any of the 2000 models.

In contrast to the models for accountability scores, several of the groups of school districts described in Tables 4 and 5 are significant in some models for these three additional measures of district performance. For transition to college in 1997, the dummy variable for Appalachian districts is significant and positive and the dummy for independent districts is very close to significance and positive (t = 1.9, p<.06). Both group coefficients are significant and positive for transition to college in 2000. The positive signs indicate that both groups have higher than average transitions to college when controlling for these other factors. It is interesting that these two groups are not significantly better performers in 1997 for dropouts and unsuccessful transitions, so an in-depth analysis of these two groups of districts and their programs addressing these outputs might prove useful. A note of caution is that even though the mean VIF for the 1997 college transitions equation is 2.06, there is some possibility of multicollinearity with one coefficient having a VIF of 4.26 and two others above 3.0 with the remainder below 2.0. Also, the mean VIFs for 2000 dropout and transition to college rates are only 1.78, but each has one VIF that is 4.06, which suggests some possibility of multicollinearity

	1997			2000		
	Dropout Rate	College Trans	Unsucc Trans	Dropout Rate	College Trans	Unsucc Trans
PREDICTORS *						
Size (x100)	.004 (4.5)	.003 (0.5)	- .002 (0.1)	.003 (3.5)	.019 (3.2)	-.003 (1.1)
Poverty	.020 (1.9)	- .312 (3.5)	.088 (2.8)	.016 (1.3)	-.255 (2.5)	.080 (2.5)
Teacher Qual	- .027 (1.2)	.002 (0.0)	- .024 (0.4)			
Competition	- .425 (1.7)	3.6 (1.9)	- .868 (1.2)	-.235 (0.9)	3.10 (1.7)	-1.81 (2.5)
Acct-comm scls	- .279 (0.7)	4.1 (1.5)	- 1.5 (1.3)	.058 (0.2)	1.15 (0.4)	.251 (0.2)
Bureaucracy	- .374 (2.9)	- 1.3 (1.4)	- .127 (0.3)	-.114 (0.9)	- 1.27 (1.3)	-.107 (0.3)
Prior acad achiev	- .031 (2.0)	.578 (4.9)	- .020 (0.4)	-.038 (2.4)	.450 (3.7)	.028 (0.6)
Teacher salary	-.0001 (2.4)	.000 (0.4)	- .000 (0.2)			
Total rev pp	- .000 (0.4)	.006 (2.5)	.001 (0.3)			
%ch total rev pp	- .800 (1.0)	-11.8 (1.9)	2.6 (1.2)	-.085 (0.1)	- 8.60 (1.6)	4.16 (2.0)
Finan resources(fs)				-.052 (0.3)	-.480 (0.6)	-.231 (0.7)
Teach resource(fs)				-.015 (0.8)	.080 (0.6)	-.098 (1.7)
Appal dummy		9.1 (4.4)		.525 (1.9)	6.54 (3.2)	
Indep dummy		4.5 (1.9)		-.872 (2.9)	5.73 (2.5)	
Intercept	13.8 (4.5)	-11.6 (0.5)	2.6 (0.3)	6.1 (2.6)	26.9 (1.5)	5.7 (0.8)
Adjusted R^2	.25	.51	.21	.32	.45	.24
F	6.5	15.4	5.4	8.2	13.3	6.9
N **	169	169	169	168	168	168
VIF	1.81	2.06	1.81	1.78	1.78	1.57

TABLE 15
DETERMINANTS OF DISTRICT PERFORMANCE: 1997 AND 2000

In addition to the single indicators of performance in Tables 14 and 15, I derive a composite or summary measure of performance in 2000 - - a score based on a factor analysis of six indicators - - CATS score and rates of attendance, retention, dropouts, transitions to college, and unsuccessful transitions. The predictors of this composite measure are the same as in Table 15 and the full model is presented below.

$$PERF2000 = - 1.3 \text{ intercept} - .003 \text{ size*} - .005 \text{ pov*} + .386 \text{ comp} - .311 \text{ acctcomsch}$$
$$(0.7) \quad\quad (4.4) \quad\quad (5.6) \quad\quad (1.9) \quad\quad (1.0)$$

$$+ .075 \text{ burea} + .050 \text{ acadsuc*} - 1.5 \text{ chtotrev*} - .044 \text{ finres} + .022 \text{ tchres}$$
$$(0.7) \quad\quad (3.9) \quad\quad (2.6) \quad\quad (0.5) \quad\quad (1.4)$$

$$\text{Adj } R^2 = .60$$
$$F = 29.3$$
$$N = 168$$
$$\text{Mean VIF} = 1.57$$

Estimation of the model for summary of performance is very similar to those in Tables 14 and 15. The overall higher performing districts in 2000 are significantly more likely to be smaller, have lower rates of poverty, higher rates of previous academic success, and smaller proportional increases in total per pupil revenue.

CONCLUSIONS

The first conclusion from the data and models analyzed above is that after the initial years of KERA implementation when substantial, comprehensive change occurred, the Kentucky public school system has settled into a pattern of relative stability and incremental change. The one major exception to this pattern of incremental change is the change in the accountability system from KIRIS to CATS in 1999 that increased average districts scores 35 percent in one year. Despite that huge one-year increase in scores, the ranking of districts changed very little in the late 1990s. Over the nine-years of accountability, the correlations of district scores from one year to the next are quite strong, especially after 1997. Few districts are improving or declining so much each year that they leap ahead or fall behind many other districts.

The question posed in the subtitle of this paper is "do teaching and financial resources moderate the negative effects of poverty?" Data at the district level suggest the answer is not positive. This analysis as well as a more extensive study by Picus, Odden, and Fermanich (September 2001) - titled "Assessing the Equity of Kentucky's

SEEK Formula: A Ten Year Analysis," http://www.kde.state.ky.us/odss/finance/seek.asp
shows that Kentucky policy makers with the implementation of KERA and the SEEK
formula have attained substantial equity in school financing. However, although district
financial and teaching resources are distributed reasonably equitably and total revenue
has increased substantially since 1990, multivariate models show that poverty and
disadvantage are strong predictors of performance, while measures of resources are
not. The analysis of the impact of finances on performance finds that although equity has
improved over time, most of the improvement occurred in the first few years of KERA
and little has changed in terms of the goal of equity since the early 1990s with the
exception that the revenue contribution of state government has declined relative to local
districts. Perhaps more important than the achievement of equity in financing, this
analysis finds that revenue appears to have little or no independent impact on district
performance.

      As education funding has become more equitable across districts, funding
adequacy is becoming a more prominent issue. Although most models of funding
adequacy assume that resources have positive impacts on performance, in this
research, multivariate models show only modest and inconsistent impacts of financial
and teaching resources on accountability scores and other performance measures. Total
revenue per pupil is related positively to accountability scores only in the1997 model,
while percentage change in total revenue is significant but negative in several models
indicating that greater proportional increases in total revenue predict to lower scores.
These findings indicate the need for caution about revenue-performance linkages and
assertions of revenue inadequacy. If the "burden of proof" of resource inadequacy is on
the advocates of increased revenue, then policy makers should seek at least some
reasonable data and systematic studies demonstrating positive and significant impacts
of resources on organization performance.

      To summarize the findings from multivariate models of district performance,
smaller districts with less family poverty that had higher levels of academic achievement
prior to KERA have significantly higher accountability scores, somewhat higher rates of
transition to college, lower dropout rates, and lower rates of unsuccessful transitions
when controlling for other plausible predictors of performance. Measures of financial and
teaching resources have much less consistent and significant impacts on performance.
Although the distribution of resources remains relatively equitable and total revenue has
increased substantially since 1990, multivariate models show that poverty and
disadvantage are strong predictors of performance, while measures of resources are
not. Resource equity and adequacy appear not to reduce the negative effects of poverty
on performance.

      Most education reformers and policy makers likely would agree that the primary
goal of school reform is increased student learning or achievement, however many
would diverge substantially over the most effective means to accomplish this goal. For
example, few would question that improved organization effectiveness and efficiency
would be necessary to accomplish the goal of increased student achievement, but some
reformers would see market-based changes such as privatization and school vouchers
as the most desirable means to achieve school effectiveness and efficiency, while others
would advocate increased equity and adequacy in organization resources as necessary
for improved organization performance. A case could be made that Kentucky's school
districts have accomplished much in the ten plus years of KERA implementation,
however as these data on performance and the determinants of that performance
suggest, much remains ambiguous and uncertain, especially the role of teaching and
financial resources in achieving high levels of performance.

NOTES

1. Some studies of school and school district size find that the "strength and directionality of the relationship of size to achievement is linked to (or contingent on) community socioeconomic status" (Johnson, Howley, and Howley, February 2002). I do not examine this interaction effect or test the poverty X size interaction for several reasons. First, I did not find evidence for this interaction effect in my recent examination of school size in the two largest districts in the state. Second, it is highly unlikely that school district boundaries would be changed by policy makers. There is only one large urban district (Jefferson County including Louisville) and possibly another (Fayette including Lexington) that realistically could be "broken up" into several smaller districts, while most of the other districts are already small and rural. Third, many of the smaller districts are "independent" districts or small districts within a larger county district. A dummy variable for independent/non-independent districts) is included in multivariate models to see if these districts have any significant effects on performance, and mostly they do not. (see Table 4 and the discussion of Tables 14 and 15)

SOURCES

Blackford, Linda B. 2002a. Schools Seek Revenue Increase: Group That Sued for '90 Reform is Re-established. Lexington Herald-Leader, June 25.

Blackford, Linda B. 2002b. Patton Agrees With Educators Funding Is Low. Lexington Herald-Leader. July 31.

Ferguson, Ronald F. and Helen F. Ladd. 1996. How and Why Money Matters: An Analysis of Alabama Schools. Chapter 8 in Helen F. Ladd (ed.). Holding Schools Accountable. Wash., DC: The Brookings Institution.

Garson, G. David. N.D. Multiple Regression. North Carolina State University. http://www2.chass.ncsu.edu/garson/pa765/regress.htm

Hanushek. Eric A. 1981. Throwing Money at Schools. Journal of Policy Analysis and Management 1: 19-41.

Hanushek, Eric A. 1996. School Resources and Student Performance. Chapter 2 in Gary Burtless (ed.). Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success. Wash., DC: Brookings Institution Press.

Hanushek Eric A. and John E. Jackson. 1977. Statistical Methods for Social Scientists. New York: Academic Press.

Hedges, Larry V., Richard D. Laine, and Rob Greenwald. 1994. Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes. Educational Researcher 23 (3): 5-14.

Hedges, Larry V., and Rob Greenwald. 1996. Have Times Changed? The Relation Between School Resources and Student Performance. Chapter 3 in Gary Burtless (ed.). Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success. Wash., DC: Brookings Institution Press.

Johnson, J.D., Howley, C.B., and Howley, A.A. March 2002. Small Works in Arkansas. How Poverty and the Size of Schools and School Districts Affect School Performance in Arkansas. The Rural School and Community Trust. http://www.ruralchallengepolicy.org/AR_REP02.html

Kentucky Department of Education
http://www.kde.state.ky.us/comm/commrel/school_report_card/

Office of Education Accountability (KY), 1999. Annual Financial Report. December.

Picus, Lawrence O., Allan Odden, and Mark Fermanich. September 2001. Assessing the Equity of Kentucky's SEEK Formula: A Ten-Year Analysis. http://www.kde.state.ky.us/odss/finance/seek.asp

Allan Odden and Lawrence O. Picus. September 2001. Assessing SEEK from an Adequacy Perspective. http://www.kde.state.ky.us/odss/finance/seek.asp

Prichard Committee for Academic Excellence (2002). Districts Reexamine School Spending Summer. Perspectives. vol 13. no. 2

Roeder, Phillip W. 1999. Education Reform and Equitable Excellence: The Kentucky Experiment. http://www.uky.edu/~proeder/keraweb.htm

Roeder, Phillip W. 2001. A Report on KERA Report Cards. July. http://www.uky.edu/~proeder/keraweb.htm

APPENDIX A

TABLE A-1		
TOP AND BOTTOM TENTH PERFORMING DISTRICTS (1993)		
DISTRICT	1993 KIRIS Score	2001 CATS Score
TOP 10TH 1993		
ANCHORAGE IND	64.5	98.1
BEECHWOOD IND	47.7	82.0
BEREA IND	42.0	69.0
CALLOWAY CO	43.9	72.8
DAVIESS CO	41.1	82.4
ELIZABETHTOWN IND	43.5	77.8
FT THOMAS IND	49.4	92.0
HENRY CO	41.4	65.7
MURRAY IND	44.9	80.4
OLDHAM CO	46.3	88.0
PAINTSVILLE IND	46.6	79.7
PIKEVILLE IND	42.0	80.0
RUSSELLVILLE IND	41.7	68.5
SCIENCE HILL IND	48.6	83.5
SOMERSET IND	43.6	71.3
SOUTHGATE IND	45.9	71.2
WILLIAMSBURG IND	44.1	74.2
MODEL LAB (Richmond)	49.7	85.4
BOTTOM 10TH 1993		
AUGUSTA IND	30.4	61.9
BREATHITT CO	31.5	58.8
CAVERNA IND	31.7	65.7
CLAY CO	28.7	59.7
COVINGTON IND	29.5	52.8
DAYTON IND	28.4	62.0
GALLATIN CO	31.3	63.7
GRANT CO	31.7	70.7
HARLAN CO	30.3	57.9
JACKSON CO	29.9	61.7
KNOX CO	30.2	55.0
LAWRENCE CO	31.3	62.8
NEWPORT IND	28.4	61.4
NICHOLAS CO	31.7	59.8
OWSLEY CO	29.6	60.4
PINEVILLE IND	31.5	68.1
SILVER GROVE IND	29.4	64.7
WOLFE CO	31.1	67.6

APPENDIX B

TABLE B-1 APPALACHIAN SCHOOL DISTRICT PERFORMANCE *								
	1994		1996		1998		2000	
	Appal	Non	Appal	Non	Appal	Non	Appal	Non
Attendance	94.7	95.4	94.2	95.2	93.7	94.9	93.7	95.0
Total Mean	95.2		94.8		94.4		94.5	
Retention	2.7	2.9	3.7	3.2	4.0	3.5	4.1	3.3
Total Mean	2.8		3.4		3.7		3.6	
Dropout	3.7	3.0	3.4	3.1	3.9	3.1	3.5	2.6
Total Mean	3.3		3.2		3.4		2.9	
Transition/College	48.7	47.7	48.4	48.7	49.2	49.1	49.8	50.4
Total Mean	48.3		48.7		49.2		50.3	
Unsucc Transition	8.2	4.8	7.2	4.1	7.8	4.9	7.8	4.1
Total Mean	6.1		5.3		6.0		5.6	

* The description of groupings can be found in the note to Table 2.

TABLE B-2 COUNCIL FOR BETTER EDUCATION (CBE) SCHOOL DISTRICT PERFORMANCE *								
	1994		1996		1998		2000	
	CBE	Non	CBE	Non	CBE	Non	CBE	Non
Attendance	95.0	95.3	94.6	94.9	94.1	94.6	94.2	94.7
Total Mean	95.2		94.8		94.4		94.5	
Retention	2.8	2.8	3.6	3.3	3.8	3.6	3.7	3.6
Total Mean	2.8		3.4		3.7		3.6	
Dropout	3.5	3.2	3.3	3.1	3.7	3.3	2.9	3.0
Total Mean	3.3		3.2		3.4		2.9	
Transition/College	43.8	50.6	44.6	50.8	43.8	52.2	46.5	52.3
Total Mean	48.3		48.7		49.2		50.3	
Unsucc Transition	7.4	5.4	5.9	5.0	6.8	5.6	6.9	4.8
Total Mean	6.1		5.3		6.0		5.6	

* The description of groupings can be found in the note to Table 2.

TABLE B-3 INDEPENDENT SCHOOL DISTRICT PERFORMANCE *								
	1994		1996		1998		2000	
	Indep	Non	Indep	Non	Indep	Non	Indep	Non
Attendance	95.3	95.1	95.0	94.7	94.8	94.2	94.9	94.3
Total Mean	95.2		94.8		94.4		94.5	
Retention	2.5	2.9	3.3	3.5	3.2	3.9	3.2	3.8
Total Mean	2.8		3.4		3.7		3.6	
Dropout	2.8	3.5	2.4	3.6	2.7	3.7	2.0	3.3
Total Mean	3.3		3.2		3.4		2.9	
Transition/College	55.1	45.1	57.6	44.7	55.9	46.2	57.6	47.0

Total Mean	48.3		48.7		49.2		50.3
Unsucc Transition	5.1	6.6	3.9	5.9	5.7	6.1	4.5	6.0
Total Mean	6.1		5.3		6.0		5.6

* The description of groupings can be found in the note to Table 2.

TABLE B-4
DISADVANTAGED SCHOOL DISTRICT PERFORMANCE *

	1994		1996		1998		2000	
	Disad	Adv	Disad	Adv	Disad	Adv	Disad	Adv
Attendance	94.4	95.6	93.5	95.3	92.8	95.3	92.9	95.5
Total Mean	95.2		94.8		94.4		94.5	
Retention	3.7	2.0	4.0	2.4	4.7	2.6	4.6	2.5
Total Mean	2.8		3.4		3.7		3.6	
Dropout	4.3	1.9	4.4	2.0	4.7	2.0	4.2	1.7
Total Mean	3.3		3.2		3.4		2.9	
Transition/College	40.6	67.9	39.5	66.3	40.7	65.1	41.8	65.3
Total Mean	48.3		48.7		49.2		50.3	
Unsucc Transition	10.6	2.1	9.4	2.4	10.4	3.3	10.2	2.6
Total Mean	6.1		5.3		6.0		5.6	

* The description of groupings can be found in the note to Table 2.

TABLE B-5
RURAL SCHOOL DISTRICT PERFORMANCE *

	1994		1996		1998		2000	
	Rural	Urb	Rural	Urb	Rural	Urb	Rural	Urb
Attendance	95.2	95.0	94.2	94.7	94.4	94.7	94.4	94.9
Total Mean	95.2		94.8		94.4		94.5	
Retention	2.9	2.5	3.7	2.8	3.9	2.6	3.8	3.0
Total Mean	2.8		3.4		3.7		3.6	
Dropout	3.4	2.7	3.4	2.8	3.5	2.8	3.1	2.2
Total Mean	3.3		3.2		3.4		2.9	
Transition/College	47.1	52.8	48.4	55.7	48.2	53.8	49.3	54.3
Total Mean	48.3		48.7		49.2		50.3	
Unsucc Transition	6.6	4.0	7.2	3.0	6.5	3.7	6.1	3.2
Total Mean	6.1		5.3		6.0		5.6	

* The description of groupings can be found in the note to Table 2.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

ERIC REPRODUCTION RELEASE

I. Document Identification:

Title: School District Performance in Kentucky (1993-2001): Do Teaching and Financial Resources Moderate the Negative Effects of Poverty?

Author: Phillip W. Roeder

Corporate Source: University of Kentucky

Publication Date: August 2002

II. Reproduction Release:

In order to disseminate as widely as possible timely and significant materials
of interest to the educational community, documents announced in the monthly
abstract journal of the ERIC system, Resources in Education (RIE), are usually
made available to users in microfiche, reproduced paper copy, and electronic
media, and sold through the ERIC Document Reproduction Service (EDRS). Credit
is given to the source of each document, and, if reproduction release is
granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document,
please check one of the following three options and sign the release form.

__X__ Level 1 - Permitting reproduction and dissemination in microfiche or other
ERIC archival media (e.g. electronic) and paper copy.

_____ Level 2A - Permitting reproduction and dissemination in microfiche and in
electronic media for ERIC archival collection subscribers only.

_____ Level 2B - Permitting reproduction and dissemination in microfiche only.

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no option is marked, documents will
be processed at Level 1.

Sign Here: "I hereby grant to the Educational Resources Information Center
(ERIC) nonexclusive permission to reproduce and disseminate this document as
indicated above. Reproduction from the ERIC microfiche or electronic media by
persons other than ERIC employees and its system contractors requires
permission from the copyright holder. Exception is made for non-profit
reproduction by libraries and other service agencies to satisfy information
needs of educators in response to discrete inquiries."

Signature: Phillip W. Roeder

Printed Name: Phillip W. Roeder

Address: Dept. of Political Science
1615 Patterson Tower
Univ. of Kentucky
Lexington, KY 40506-0027

Position: Professor

Organization: University of Kentucky

Telephone No: 859. 257. 1118

Date: Oct 7, 2002

III. Document Availability Information (from Non-ERIC Source):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:

Address:

Price per copy: Quantity price:

IV. Referral of ERIC to Copyright/Reproduction Rights Holder:

If the right to grant this reproduction release is held by someone other than the addressee, please complete the following:

Name:

Address:

V. Attach this form to the document being submitted and send both to:

Velma Mitchell, Acquisitions Coordinator
ERIC Clearinghouse on Rural Education and Small Schools
P.O. Box 1348
1031 Quarrier Street
Charleston, WV 25325-1348

Phone and electronic mail numbers:

  800-624-9120 (Clearinghouse toll-free number)
  304-347-0467 (Clearinghouse FAX number)
  mitchelv@ael.org